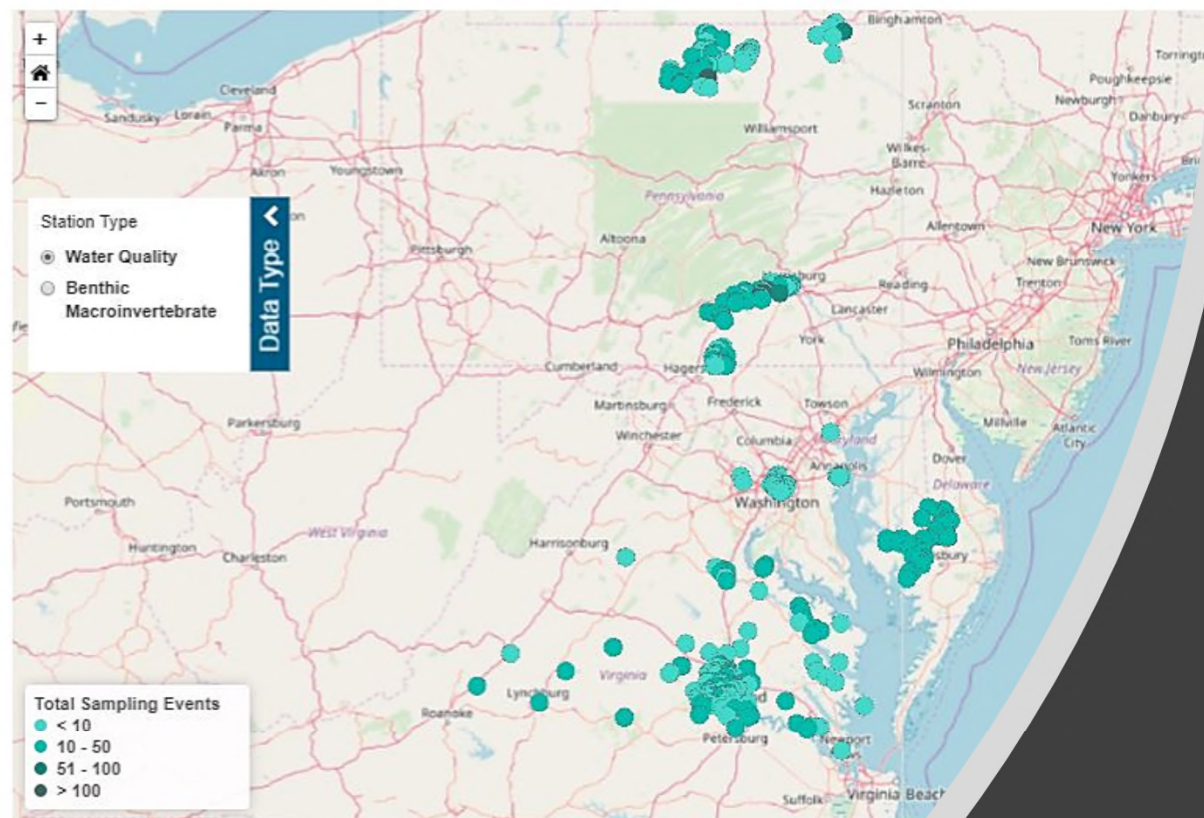


Welcome to the Chesapeake Data Explorer!

This is your gateway into data collected by a Chesapeake Basin-wide network of volunteer and non-traditional water quality monitors. Use the **Map** tab to view the database or to view Water Quality or Benthic Macroinvertebrate data on the map. Use the **Query** tab for more complex interactions and access to data do

Map

Query



Database Statistics

The summary statistics below provide an overview of the current scope of the Data Explorer.

66526
WATER QUALITY
RECORDS

921
BENTHIC
MACROINVERTEBRATE
RECORDS

332
MONITORS

13348
MONITORS

Volunteer-Friendly Techniques for Integrating Diverse Data into an Open Access Database

Helen Schlimm

Alliance for Aquatic Resource Monitoring (ALLARM)

Dickinson College

March 26, 2019

National Monitoring Conference, Denver CO

Outline

- ALLARM Overview
- Chesapeake Monitoring Cooperative Introduction
- Chesapeake Data Explorer
 - Data input
 - Data output & visualization
- Tools for volunteers
- Lessons learned

Dickinson



CMC
Chesapeake Monitoring
Cooperative



Who is ALLARM?



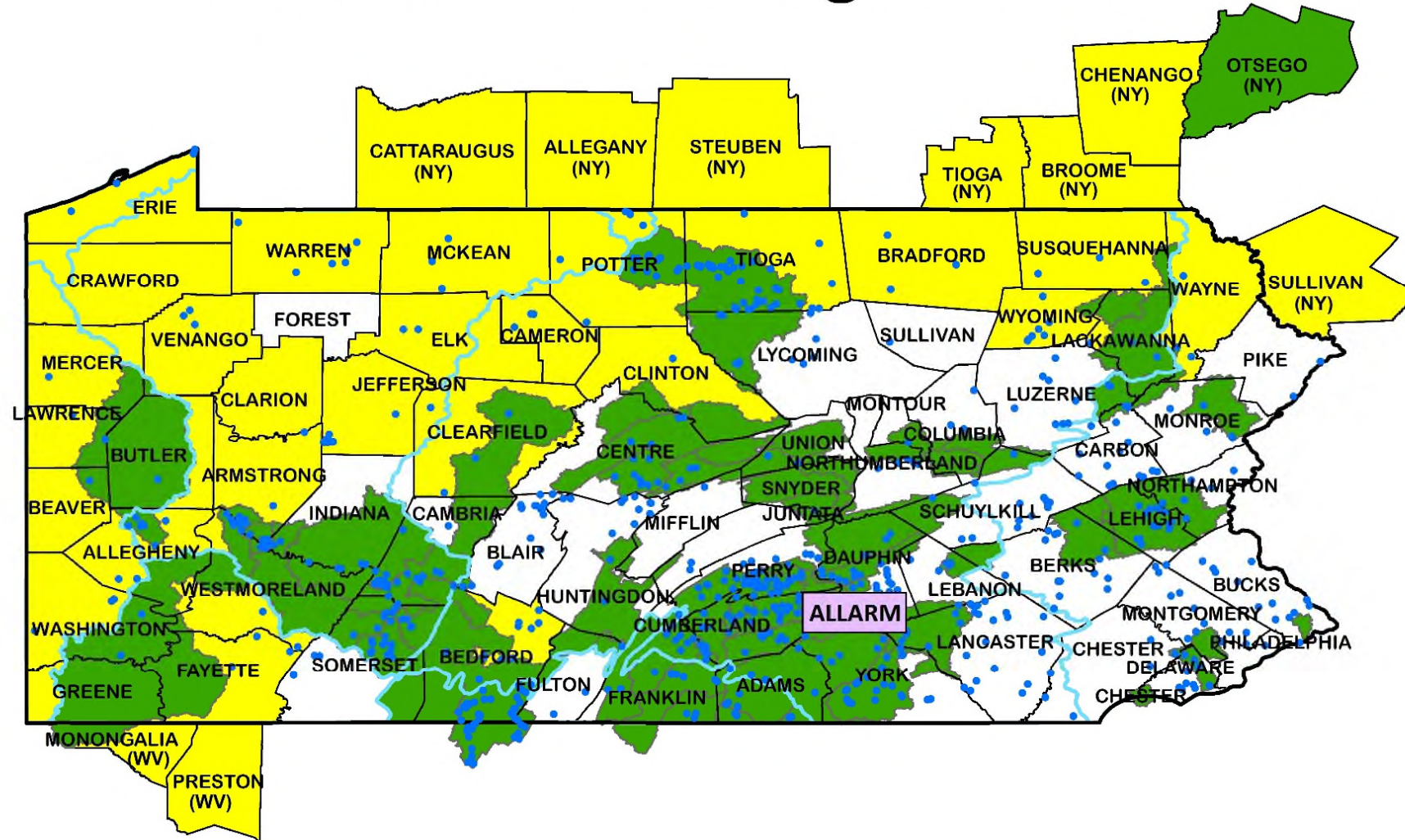
Dickinson

- Program of Dickinson College, Carlisle PA
- Founded in 1986
- 12-16 student Watershed Coordinators
- 4 full-time staff
- 45% supported by the college, 55% funded by federal, state, family foundation grants

Mission: Empower communities with scientific tools to understand the health of their streams and participate in local decision making.



ALLARM Monitoring Assistance



Alliance for Aquatic Resource Monitoring
Dickinson College
717.245.1565
www.dickinson.edu/ALLARM

Data Sources: ALLARM, NYS Office of Cyber Security, PA DOT, PSU, USGS, WVDEP



March 2018

- Acid Rain Sites
- Watershed Monitoring Groups
- Shale Gas Monitoring Workshops
- 6 Major PA Watersheds

Chesapeake Monitoring Cooperative

A partnership that aims to provide **technical, logistical, and outreach support** for the integration of volunteer-based and nontraditional water quality and benthic macroinvertebrate monitoring data into the Chesapeake Bay Program (CBP) partnership.

Cooperative Agreement

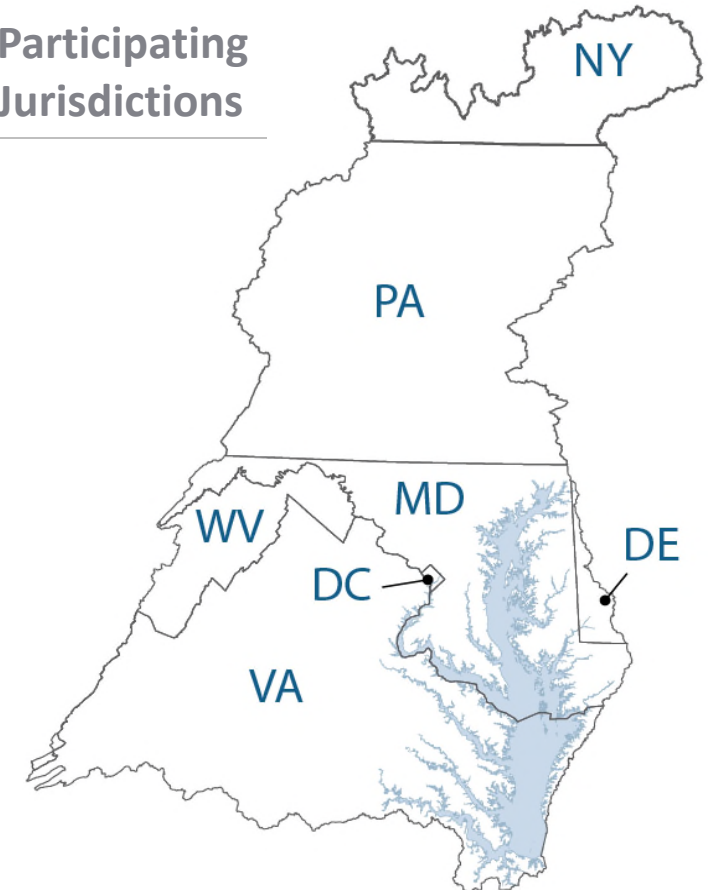


CMC development team partners & service providers



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

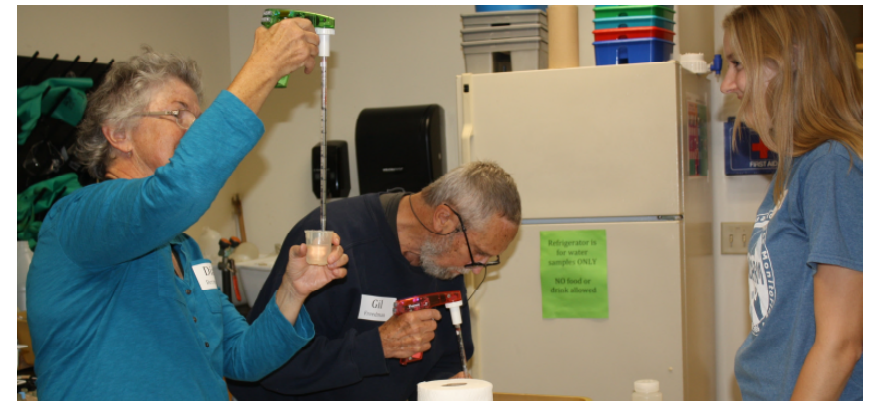
Participating Jurisdictions



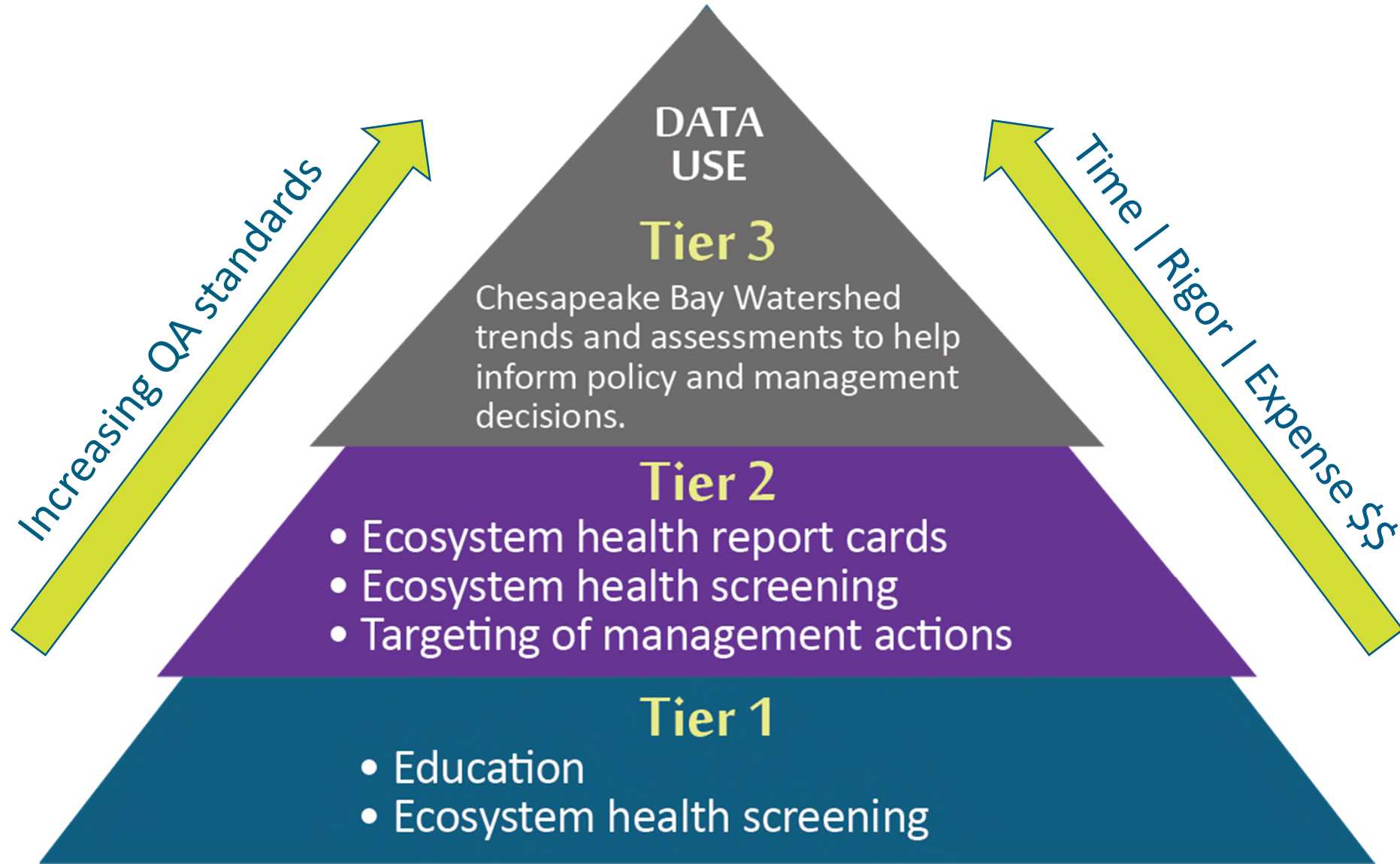
USEPA Grant #CB96334901

Data Integration Process

- Develop central repository for watershed-wide data input
- Coordinate with Bay Program- integrated monitoring system
- Current data?
 - Review monitoring program
 - Study design/QAPP
 - Review data/metadata
 - Feedback & integration
- New program?
 - Study design
 - Monitoring trainings
 - Data management
 - Data integration



Tiered Framework



Rubric for Assessing Data

Tier Assessment of Current Non-Tidal Monitoring Groups				
Group Name:				
Contact Name:			Contact Email:	
Contact Phone:			State:	
Programmatic				Notes or Comments
Written Study Design?	Yes	Preferred, not required		
	No			
Program Methods Manual	CMC	Tier I or II		
	Non-CMC	Compare to CMC		
	No	Do not include		
Program QAPP?	CMC	Tier I or II		
	Non-CMC	Compare to CMC		
	No	All data provisional		
Documented Site locations w/	Yes	Tier I or II		
	No	Do not include		
Sampling Location				
Sampling Location	Boat mid channel	Tier II		
	Wade in mid channel	Tier II		
	Bridge/Dock mid channel	Tier II		
	Shore line	Tier I		
QA/QC				
Field replicates (10%)	Yes	Tier II		
	No (10%)	Tier I		
Lab Duplicate	Yes	Tier II		
Sampling (10%)	No	Tier I		
Lab Field Blanks (10%)	Yes	Tier II		
	No	Tier I		
Field Parameters				
Alkalinity	Titration Kit	Tier II		
	Hanna Digital Checker	Tier I		
	Hanna Digital Checker			
	Standardized	Tier II		

←
→
Tidal
Non-Tidal
+

Tier

P

P1

1

P2

2

P3

3

Metadata is key!

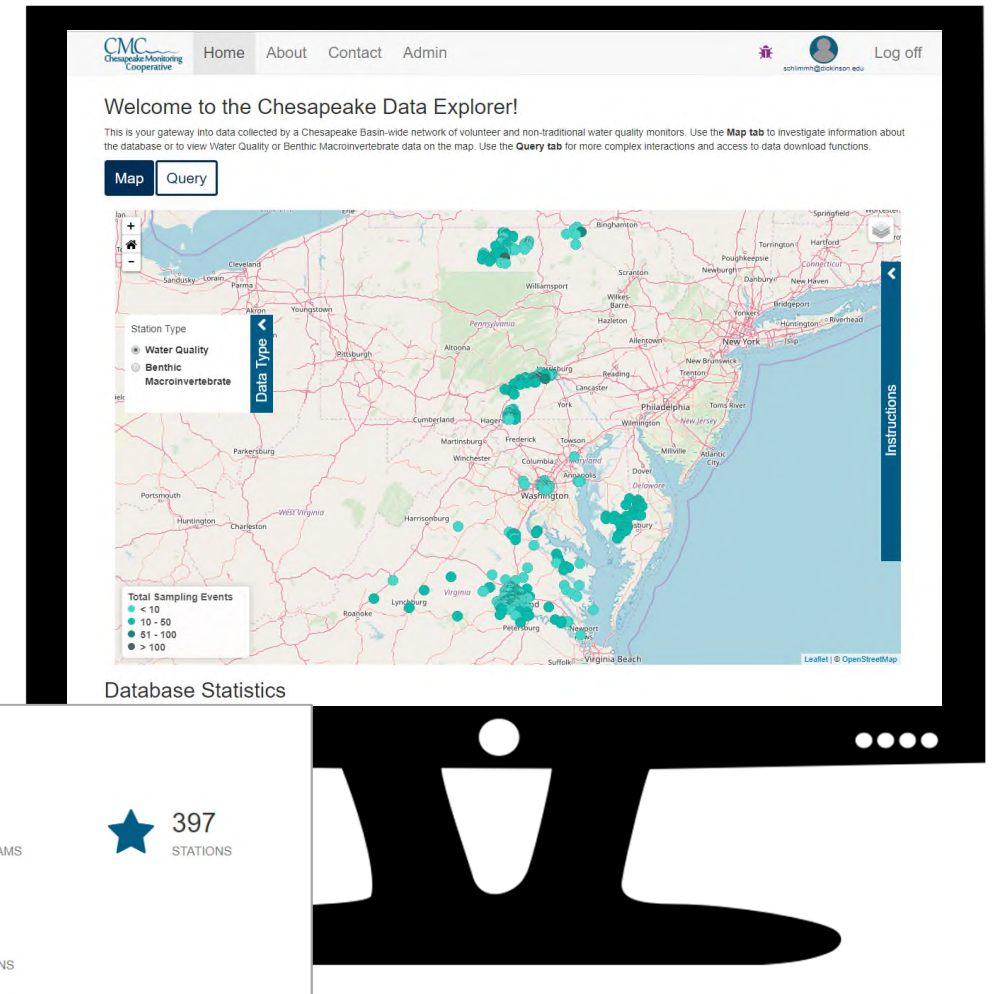
Monitoring Mantras

- All data of known quality have use
- Data must match quality with intended use



Developing a Database

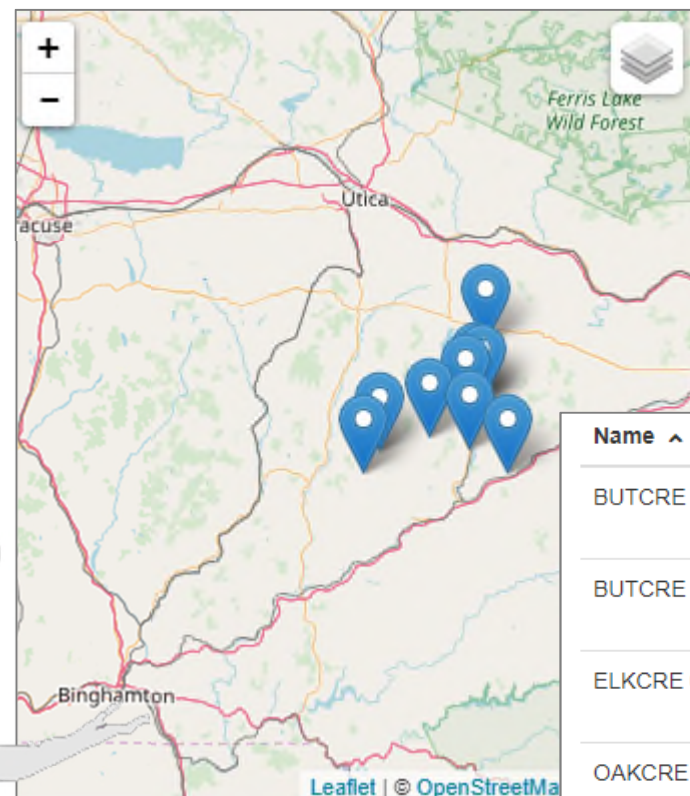
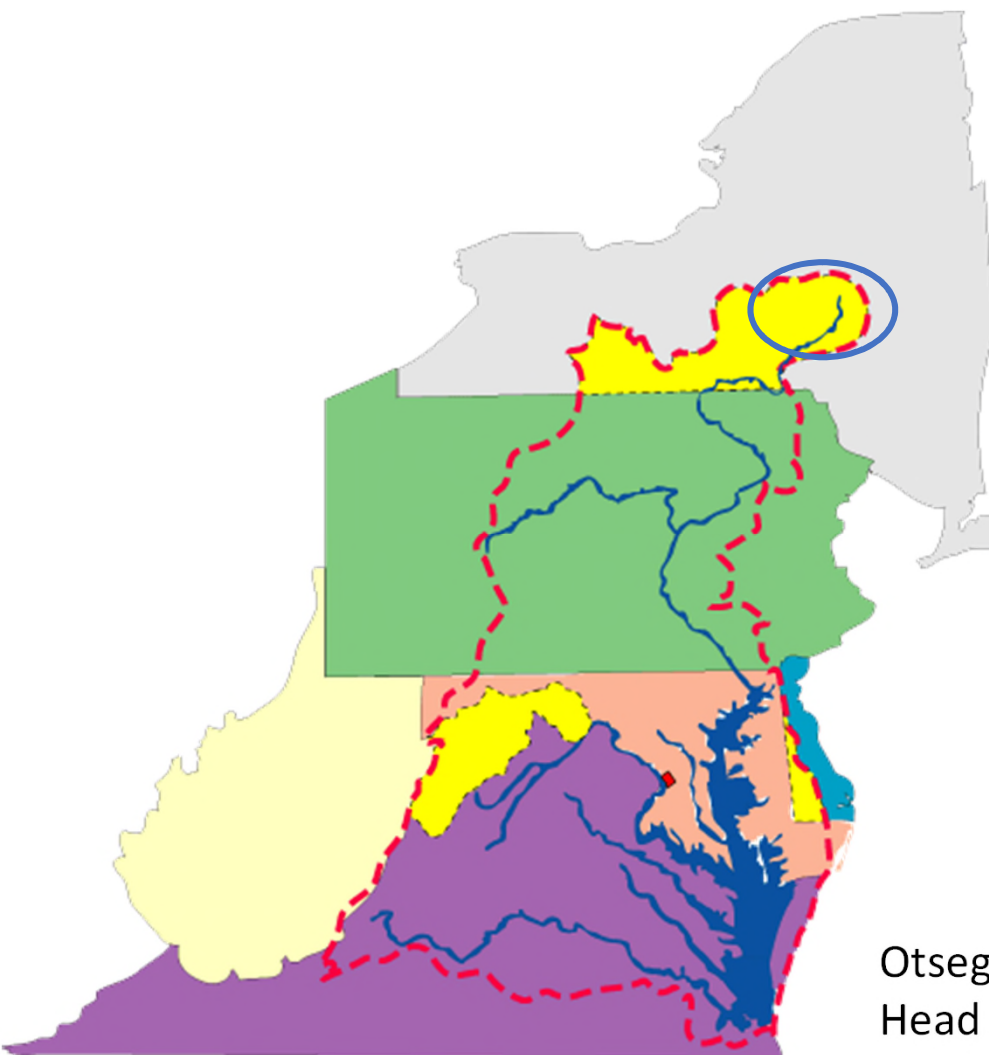
- Capture volunteer/group info
- Record site locations
- Data input
- Data output and visualization
- Metadata management



Group/Volunteer Management

Groups			
<div>Show My Group + Add New Group Download Groups</div>			
Name ^	Description	Email	Cmc Members
<input type="text" value="Filter Name"/>	<input type="text" value="Filter Description"/>	<input type="text" value="Filter Email"/>	<div>Nothing selected ▾</div>
Maymont Foundation	RiverTrends	kweatherford@maymont.org	Liz Chudoba; Amy Hagerdon View Details / Edit
Middle Spring Watershed Association	ALLARM partner group in Shippensburg, PA.	schlimmh@dickinson.edu	Helen Schlimm View Details / Edit
Nanticoke Watershed Alliance	Formed in 2007, the Nanticoke Creekwatchers Program collects data in the entire Nanticoke River watershed from late March through early November each season. On average, 40 citizen scientists assist each season, serving over 1,000 hours each year. The tidal program is now Tier 3.	bethwasden@nanticokeriver.org	Caroline Donovan View Details / Edit
New River Valley Virginia Master Naturalists			Emily Bialowas View Details / Edit
Northern Neck Master Naturalists	RiverTrends	patunia46@aol.com	Amy Hagerdon View Details / Edit
Northern Virginia Soil and Water Conservation District	NVSWCD submits their data to IWLA VA SOS. ACB updated their thermometers and pH meters in November 2017 in order to collect higher quality chemical data as well.	Daniel.Schwartz@fairfaxcounty.gov	Liz Chudoba View Details / Edit
Northern Virginia Trout Unlimited			Emily Bialowas View Details / Edit
Otsego County Conservation Association	ALLARM partner group in Otsego County, NY.	schlimmh@dickinson.edu	Helen Schlimm View Details / Edit
Peninsula Chapter Virginia Master Naturalists	Falls under VA DEC volunteer group	David.Schultz@conservation.org	Liz Chudoba View Details / Edit
Prince William Soil and Water Conservation District	PWSWCD submits their data to IWLA VA SOS. ACB updated their thermometers and pH meters in November 2017 in order to collect higher quality chemical data as well.	waterquality@pwsacd.org	Liz Chudoba View Details / Edit


Site Documentation



Name ^	Group Name(s)	Latitude	Longitude	
BUTCRE 17.90	Otsego County Conservation Association	42.55	-75.24	📍
BUTCRE 23.20	Otsego County Conservation Association	42.59	-75.19	📍
ELKCRE 0.05	Otsego County Conservation Association	42.54	-74.84	📍
OAKCRE 0.72	Otsego County Conservation Association	42.67	-74.96	📍
OTECRE 21.08	Otsego County Conservation Association	42.62	-75.06	📍
REDCRE 1.34	Otsego County Conservation Association	42.69	-74.92	📍
SUSRIV 466.75	Otsego County Conservation Association	42.69	-74.93	📍
UNTOTSLAK 0.37	Otsego County Conservation Association	42.81	-74.90	📍
UNTSUSRIV 0.81	Otsego County Conservation Association	42.59	-74.95	📍

Otsego County, NY
Head of the Susquehanna River

Methods Documentation

<div><div>CMC Chesapeake Monitoring Cooperative</div><div>AdminDataProfileManage</div><div><div>schlimmh@dickinson.edu</div><div>Log off</div></div></div>					
<div>Parameters<div>+ Add New Parameter</div><div>Download Parameters</div></div>					
Name ^	Code	Units	Equipment	Tier	
<div>Nitrogen</div>	<div>Filter Code</div>	<div>Filter Units</div>	<div>Filter Equipment</div>	<div>Filter Tier</div>	
Ammonia-nitrogen	NH4N.1	mg/L	Specific to individual lab	2	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.3	mg/L	Zinc reduction colorimetric kit (ex. LaMotte 3354)	1	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.4	mg/L	Spectrophotometer; Colorimeter; Specific to individual lab	2	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.1	mg/L	Cadmium reduction colorimetric kit (ex. Hach NI-14 1416100; LaMotte 3110)	1	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.5	mg/L	Cadmium reduction colorimetric kit (ex. Hach NI-14 1416100; LaMotte 3110)	p1	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.6	mg/L	Spectrophotometer; Colorimeter; Specific to individual lab	p2	<div>View Details / Edit</div>
Nitrate-nitrogen	NO3N.7	mg/L	Colorimeter (ex. Hach)	1	<div>View Details / Edit</div>

Equipment

Cadmium reduction colorimetric kit (ex. Hach NI-14 1416100; LaMotte 3110)

Precision

0.01 mg/L (0 - 1 mg/L); 0.1 mg/L (1 - 10 mg/L)

Accuracy

Enter Accuracy

Range

0 - 1 mg/L; 1 - 10 mg/L

Quality Control Criteria

<0 mg/L; >10 mg/L

Inspection Frequency

Before each use

Inspection Type

Glassware is clean and intact; reagents have not expired

Calibration Frequency

N/A

Standard Or Calibration Instrument Used

N/A

Tier II Additional Requirements

Enter Tier II Additional Requirements

Holding Time

48 hours

Sample Preservation

Cool; <= deg C

Data Input

OTSEGO COUNTY CONSERVATION ASSOCIATION FIELD DATA SHEET

1. Check that your equipment is prepared and calibrated:

<input checked="" type="checkbox"/>	Equipment Prep
<input type="checkbox"/>	Equipment gathered, inspected, and ready to use
<input type="checkbox"/>	LaMotte Tracer PockeTester calibrated with 84 & 1,413 $\mu\text{S}/\text{cm}$ calibration solution

2. Record the sampling and site information in the boxes below:

Sampling Information		Site Information	
Monitor Name		Stream Name	
Sample Collection Date		Site ID	
Sample Collection Time			

3. Record general observations in the boxes below:

Air Temperature ($^{\circ}\text{C}$)	
Rainfall Today (mm)	
Rainfall Within 48 Hours (mm)	
Stream Flow (circle one)	Negligible Low Normal High
Water Color (circle one)	Normal Abnormal
Water Color Description (circle one)	Clear Brown Green
Weather Conditions Today (circle one)	Sun Partial Cloud Overcast Fog Drizzle Rain Snow
Weather Conditions Yesterday (circle one)	Sun Partial Cloud Overcast Fog Drizzle Rain Snow
Observations/Notes:	

Admin
Data
Profile
Manage

Log off

Hi Helen, welcome to the data upload page! Here you can enter data for any group and station in the Chesapeake Data Explorer.

Group

Use the dropdown list to choose the group for which you will be uploading data.

Sampling Site

Use the dropdown list to choose the sampling station for which you will be uploading data.

Sample Date

Click on text box above and use the calendar that opens to choose the sample date

Sample Time

Click on the text box above to select the sample time

Conditions During Sampling

First choose the set of conditions that you would like to include on the form. Next, use the added fields to describe conditions at the sampling location at the time sampling occurred.

Stream Flow

Weather Conditions Today

Weather Conditions Yesterday

Other Conditions

Water Color

Water Color Description

(ex. "Clear, Brown, Green, etc")

Rainfall

(Total in mm the week prior to sampling; ex. 2.3)

Rainfall Within 48 Hours

(Total in mm 48 hours prior to sampling; ex. 1.2)

Data Input

4. Record at-stream and post-stream measurements in the boxes below:

Parameter	Order	Acceptable Range	Rep #1	Rep #2	Rep #3	Average
Water Temperature	At-Stream	$\pm 0.5^{\circ}\text{C}$				
Conductivity	At-Stream	$\pm 10\ \mu\text{S/cm}$				
Water Clarity	At-Stream	$\pm 10\ \text{cm}$				
Dissolved Oxygen	At- and Post-Stream	$\pm 0.6\ \text{mg/L}$				
pH	Post-Stream	$\pm 1\ \text{pH unit}$				
Nitrate	Post-Stream	0 – 2 mg/L = $\pm 1\ \text{mg/L}$ 2 – 10 mg/L = $\pm 2\ \text{mg/L}$ 10 – 15 mg/L = $\pm 5\ \text{mg/L}$				
Orthophosphate	Post-Stream	$\pm 0.04\ \text{mg/L}$				

Observations/Notes:

5. Did you test your sample within the maximum holding time for the four non-field parameters?

Parameter	Maximum Holding Time	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Dissolved Oxygen	8 hours (B)		
pH	24 hours		
Nitrate	48 hours		
Orthophosphate	48 hours		

6. Record the amount of time you spent monitoring, including:

- Preparing your monitoring equipment
- Driving to/from your site
- Collecting a water sample and measuring all 7 parameters
- Cleaning your monitoring equipment
- Entering your results into the CMC Data Explorer (when available)

_____ hours

Orthophosphate (mg/L)

Enter Orthophosphate (mg/L)

pH Kit (SU)

Enter pH Kit (SU)

Turbidity Tube (cm)

Enter Turbidity Tube (cm)

Depth Profile

Use the fields in this section to enter samples. You can enter data for additional depths by clicking the "Add Sample Depth" button. This section contains multiple data fields (referred to as "Water Quality Sample Sets"). If you do not sample all parameters each depth, please leave those fields blank.

Sample Depth (m) Note: If surface sample, enter 0.3 for Sample Depth

Enter Sample Depth (m)

Conductivity (uS/cm)

Enter Conductivity (uS/cm)

Nitrate-nitrogen (mg/L)

Enter Nitrate-nitrogen (mg/L)

Water temperature (deg C)

Enter Water temperature (deg C)

+ Add Sample Depth

Volunteer Hours

Use the field in this section to enter volunteer hours spent monitoring. Be sure to select yourself, as well as, any additional monitors participating.

Bulk Upload

LeTort Regional Authority

LT1

Use the dropdown list to choose the group for which you will be editing data.

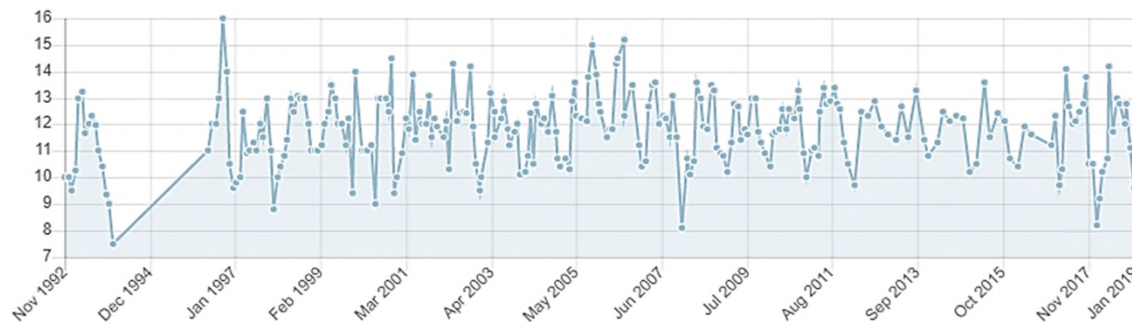
Use the dropdown list to choose the sampling station for which you will be editing data.

Station	Sample Time	Group	Samples To Publish
LT1	03/05/2018 02:01 PM	LeTort Regional Authority	0
LT1	04/18/2018 02:05 PM	LeTort Regional Authority	0
LT1	05/01/2018 02:25 PM	LeTort Regional Authority	0
LT1	06/11/2018 10:54 AM	LeTort Regional Authority	0
LT1	07/16/2018 10:22 AM	LeTort Regional Authority	0
LT1	08/09/2018 12:00 PM	LeTort Regional Authority	0
LT1	09/17/2018 12:00 PM	LeTort Regional Authority	0
LT1	10/08/2018 12:00 PM	LeTort Regional Authority	0
LT1	11/05/2018 02:04 PM	LeTort Regional Authority	0
LT1	12/10/2018 12:00 PM	LeTort Regional Authority	0

You selected samples collected from LT1 on 09/17/18, submitted by Helen Schlimm.

Choose parameter to plot

- ☒ Water temperature
- ☐ Dissolved oxygen
- ☐ pH
- ☐ Total Dissolved Solids
- ☐ Nitrate-nitrogen
- ☐ Orthophosphate
- ☐ Water Clarity
- ☐ Conductivity



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Source	Station	Date	Time	SampleDe	Paramete	Paramete	Value	Qualifier	Problem	Comments		
2	AFCB	VIMS.GI	1/1/2010	16:15:00	0.25	WaterQua	WT.1	3.3					
3	AFCB	VIMS.GI	1/1/2010	16:15:00	0.25	WaterQua	TU.1	1.27					
4	AFCB	VIMS.GPP	1/1/2010	16:15:00	0.25	WaterQua	TP.1	0.687					
5	AFCB	VIMS.GI	1/1/2010	16:15:00	0.25	WaterQua	TP.1	0.1	<		below detection limit		
6	AFCB	VIMS.GI	1/1/2010	16:15:00	0.25	WaterQua	TP.1			RR	sample broke on way to lab		
7	AFCB	VIMS.GI	1/1/2010	16:15:00		Monitor	VIMS.Johr	12					
8	AFCB	VIMS.GI	1/1/2010	16:15:00		Condition	WC	CALM					
9	AFCB	VIMS.GI	1/1/2010	16:15:00		Condition	SF	NORMAL					

Download

Download Data

Bulk Action

Delete Selected

Publish Selected

Plot Controls

Hide Plot

Edit

Edit Selected Event

- Macro program in Excel
 - Converts variable data formats to template for bulk upload
 - Reduces time and effort
- Standardize monitoring methods and resources

Convert Data



Data Output

Welcome to the Chesapeake Data Explorer!

This is your gateway into data collected by a Chesapeake Basin-wide network of volunteer and non-traditional water quality monitors. Use the **Map tab** to investigate information about the database or to view Water Quality or Benthic Macroinvertebrate data on the map. Use the **Query tab** for more complex interactions and access to data download functions.

Map

Query

On this page you can download data from the CMC Data Explorer database. Use the form below to build a query that will identify the specific data you want to download. As you step through the form, each selection will narrow down the possible options in subsequent steps. For example, if you choose James River from the "Watershed" selection box, then the subsequent selection boxes (sub-watershed, groups, stations, etc) will only show options available in the James River watershed. At the bottom of the form, use the check boxes to select the associated metadata you would like to include with your download. When you are finished making your selection, click **Get Results** to download your .csv file(s) of data.

Data Type Filter

Water Quality

Geographical Filter Type

Political Boundary

States (Pick all that apply)

All States

City/County (Pick all that apply)

All Cities and Counties

Groups (Pick all that apply)

All Groups

Stations (Pick all that apply)

All Stations

Parameters (Pick all that apply)

All Parameters

Start Date

End Date

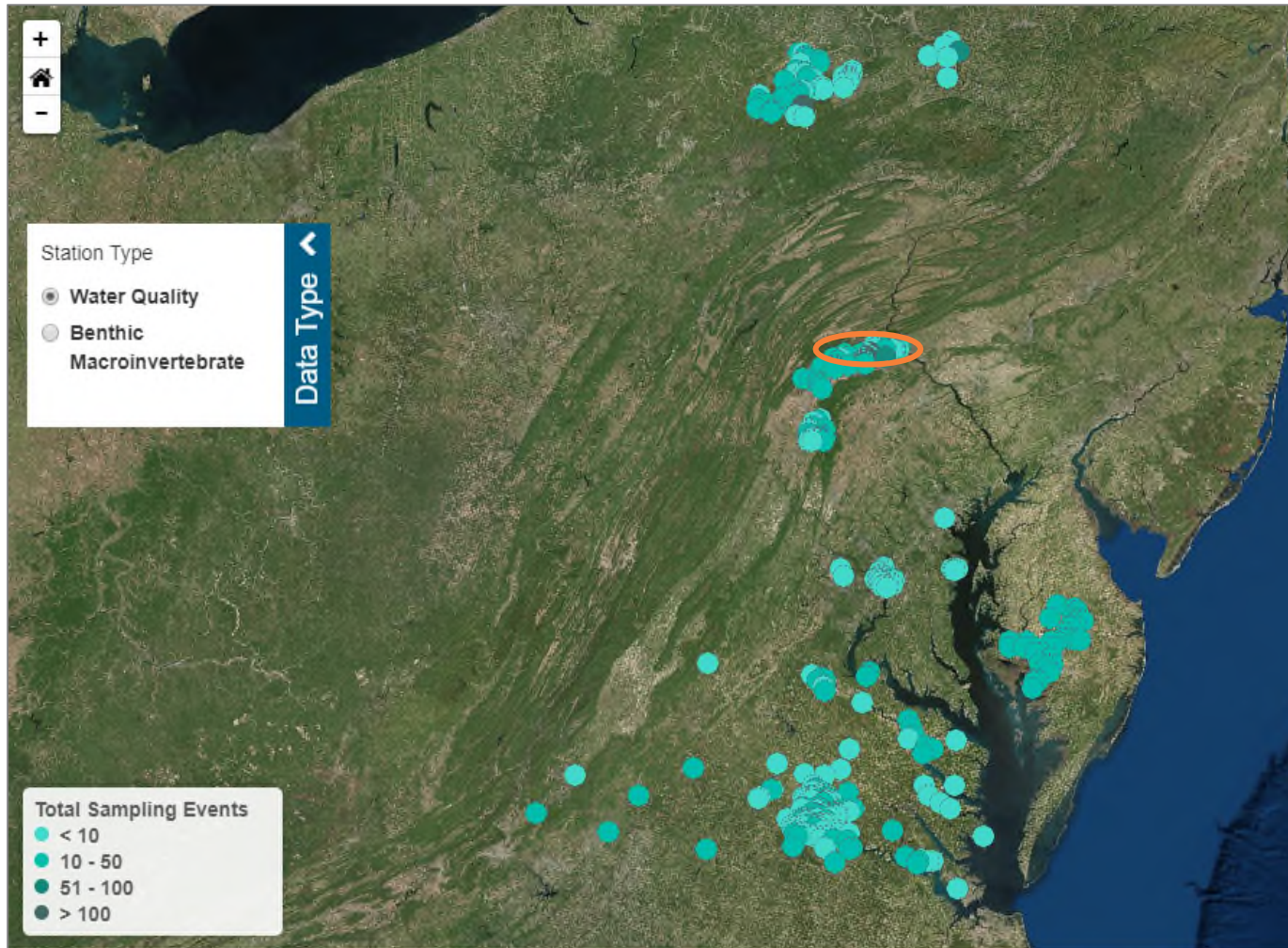
Choose Optional Metadata to Include With Download:

- ☐ Groups
- ☐ Parameters
- ☐ Stations
- ☐ Calibration Samples

Get Results

Clear All Filters

Visualization



LT6 - LeTort Spring Run 4.05

Monitored by: LeTort Regional Authority

Click a Quick Plots option to choose commonly viewed water quality data types. Click Export Plot to download the graph. Click Download Data to be taken to a data query page for this station.

Quick Plots

Dissolved oxygen mg/L | Water temperature deg C |

Water Quality Parameters

Export Plot

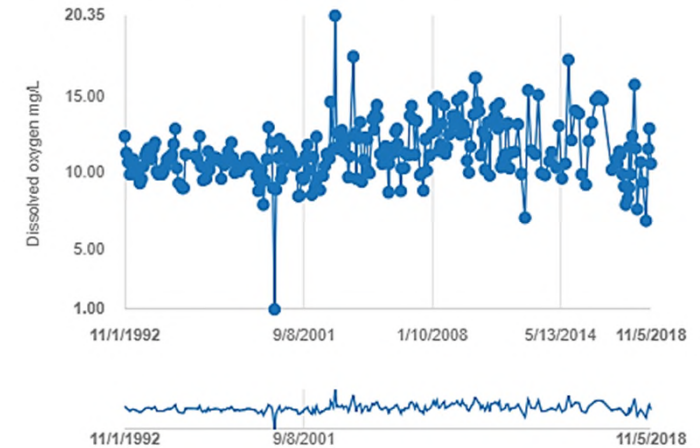
Download Data

Dissolved oxygen mg/L

Depth (m)

0.3

Values displayed on graph are daily means of duplicate samples.



Please note that parameters are consolidated in the plot where sampling methodologies may be different. Please click the "Show Details" button for more information.

+ Show Details

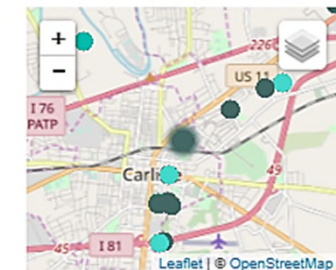
Station Profile

Description: LeTort Site 6

Location: 40.20792, -77.18104

First Sampled: November 1, 1992

Most Recent Sample: November 5, 2018



Tools for Volunteers

- User manual
- Training video series
- Data formatting program
- Website
- Published documents
- Multi-partner collaborations
- Group coordinators
- One-on-one communication
- Follow-up meetings



Quick Links:

Upload Data

Submit Station

Contact CMC Service Provider





www.chesapeakemonitoringcoop.org

Lessons Learned

- Variable data
- Need for flexibility- rigid structures challenging
- Tricky balance of technique, standard methods, QA practices
- Balance of volunteer efforts and resources
- Need for more data management tools
- Collaboration is key!
- Rewarding success stories





Questions?

Helen Schlimm

Alliance for Aquatic Resource Monitoring (ALLARM)
Dickinson College
schlimmh@dickinson.edu